Saal "Aula 1"

Sound reinforcement for Erasmus University in Rotterdam

Dirk Wedell

The Erasmus University is the largest private university in Europe and offers an education for approximately 30,000 students in four main directions: Health / Medicine; Wealth / Economics: Governance / Law and Social Sciences and Culture / History and Philosophy. The education here should be considered on quite a high level because this university (including the Financial School of Management) ranks among the top 10 in a top ten list of European universities. The other faculties, however, now measured worldwide, basically reach rankings from 35 - 40.
The Erasmus University emerged as a relatively modest institution at the beginning of the last century, when Rotterdam's merchants began to worry about qualified newcomers. In the present form, they have existed since the 60s and 70s. You can certainly call them an elite university, because the very first impression when entering the car park offers the view over very well-maintained medium and upper class cars. The university also takes a rich study fee, and already the car park costs 1300,- EUR for the 200 study days in a year.

I had the opportunity to visit three lecture halls and get to know the sound reinforcement techniques. The installs in these three rooms have just been finished and are now in the final operating form.

The new systems were supplied by the WestLab Audio company in Schwerte / Westphalia and installed in cooperation with the contract partners of the Erasmus University and the Dutch distributor of WestLab Audio.
Previously there was, of course, also audio technology, but the old system has not

Side view of Aula 1. The balcony visible at the left edge of the picture is only provided for technical purposes - there are no students/listeners here.

really worked well due to it's technical conception. In particular, the speech intelligibility was repeatedly criticized. That was actually less to the boxes, but, as I said, the concept. One had indeed tried to install a separate loudspeaker, including delay lines, for every angle and every corner, and this only led to an unnecessary amount of energy being pumped into the room, which led to an acoustic breakdown. It seemed that the - to me unknown - installer was at that time more interested in loudspeaker sales, rather than a good sounding concept. The installer of this new system was the Dutch distributor of WestLab Audio, ACS, and the contract partner of the Erasmus University, MK2.

The front fills, nine speakers total, were mounted into the staircase structure. The protection grids are very solid because shoe tips are close and legion. The vents left and right to the miniature loudspeakers don't have anything to do with the sound system.

The old system could, of course, be studied by the WestLab technicians, and so they soon knew quite well what to do, and what was to be avoided under all circumstances. One thing was certain: every excessive loudspeaker would destabilize the new concept. Also, the points in the room, where the systems were supposed to hang, were very well known. The-

An array of six WestLab LABLINE twofive, above a LABSUB twelve p

se points were compulsory in terms of space acoustics, they were neither subject to compromise nor discussion.

These points, about which I will speak later, could tragically not be reached with a lift. Therefore, one was forced to build a scaffold for these small arrays.
„Small Arrays“: That was also a powerful keyword. No one had originally believed the WestLab Audio experts that the loudspeakers visible in the pictures were enough to cover the rather voluminous rooms. But the efforts at persuasion were fruitful, and the concept was adopted after some expert talks.

Small room, Small array

In the last issue I have already mentioned the discussion about room size versus line array, and would like to deepen it further. After a recent conversation about this topic I would like to clarify, however, that it is not only about linear arrays, but about any speakers with a high-precision radiating pattern. Any loudspeakers that can be calculated in terms of radiation, regardless of their design, meet the requirements set out below.

The discussion between planners, installers and customers all too often leads to the sentence: „Tell me, do you want to spoof me?“ The discussion that follows now mostly challenges the customer, since he does not really know the actual trick and the basic function of today‘s loudspeakers. He only sees the actual visual dimensions of the space with his eyes. The sound engineer, however, looks through the eye of his loudspeaker in his mind and sees only a few rows of seats. He does not even see the two or three rows at the front. The loudspeaker system can not choose where it wants to hang, but it has to meet two requirements: firstly, the stage must not get any

Here, I got hands on an open rack für taking a photo. Clearly visible are two LABCON Mk 2 and two LABAMP 4.

Room Sorbonne: Acoustical treatment visible on walls and ceiling, but it also comes out clear how compact the sound system is.

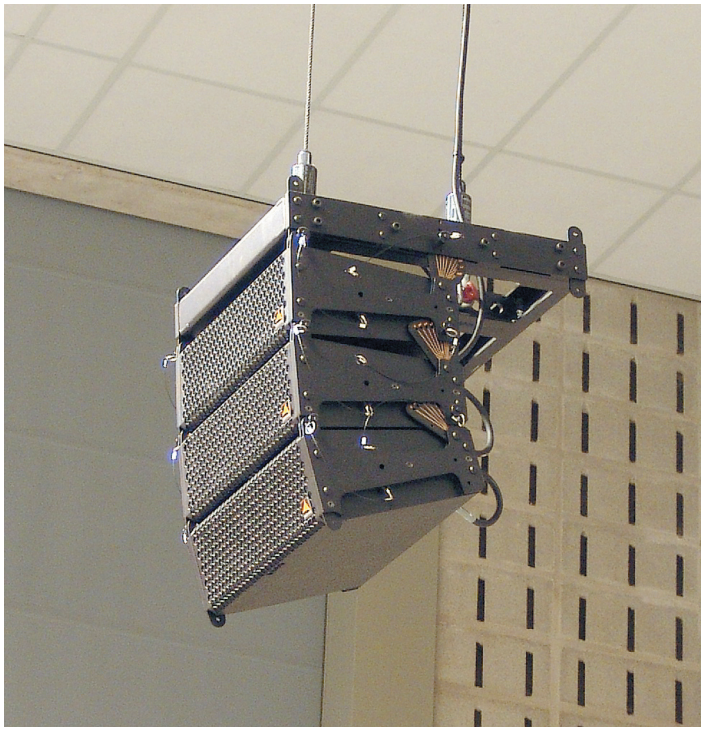
sound from the system, and second, the system should be as effective as possible. The two requirements contradict naturally and force the technician into decisions, for which there is no patent recipe. It is about compromises in the first rows or front fills.

The last row of seats is not so difficult, because the top elements of the line array (or a different system) are not scanned for physical reasons and have the narrowest possible vertical beam angle. Due to the exact vertical radiation pattern of the system, the operator can reach exactly the rearmost row, but he can avoid the impact of the sound on the rear wall. (Or at least send not too much energy there).

Let's leave the front fills, which have to be adjusted individually for each installation, I only tell you that you had to even pull out the jigsaw here in the Erasmus university, in order to realize an acoustically profitable front fill sound.

The man with a knife

A cube-like styrofoam block with handy dimensions is provided. This symbolic model concert hall is now being worked on with a knife. First, we cut the stage space with a vertical section, precisely through the position of the system. In the next step, we horizontally cut the entire space above the system. Our cuboid has now become considerably smaller. Now, however, to the detail:
The „front fill area" is also cut away. Then follow the two small rooms, which are not reached by the system laterally. Lastly, we cut off the oblique area, which is not sonicated in height. This large wedge is now also thrown away, leaving a small, rather irregularly shaped, wedge-shaped space which is clearly smaller than the trimmed waste.



Saal Sorbonne: three elements WestLab LABLINE twofive

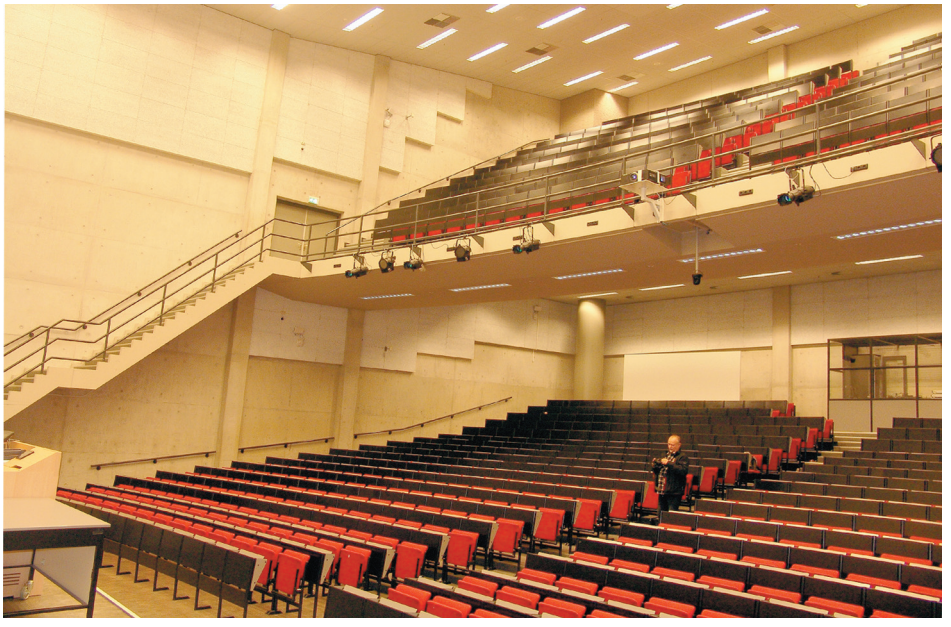
If you show your customers two Styropor-blocks - once the room as a whole and once the room, you can ask him: „Where is your room really big?“
Such simplex models are produced in 5 minutes and should actually show everyone what the room size is. I would cut it anyway in the presence of the customer, because that - I think - makes a good impression. Above all, it should be a whole new experience for the customer, as someone without a painstaking keyboard hacking and mouse clicks in a very short time a convincing visualization creates. In addition, the screen shows only a few colorful lines, but no space model
There is a limitation: this only works with truly precisely radiating systems. Small errors also have a serious effect here. Each unneeded square meter draws a rat tail of cubic meters behind it with senseless rumbling echoes, resonances and focussing.

WestLab Audio LABLINE twofive

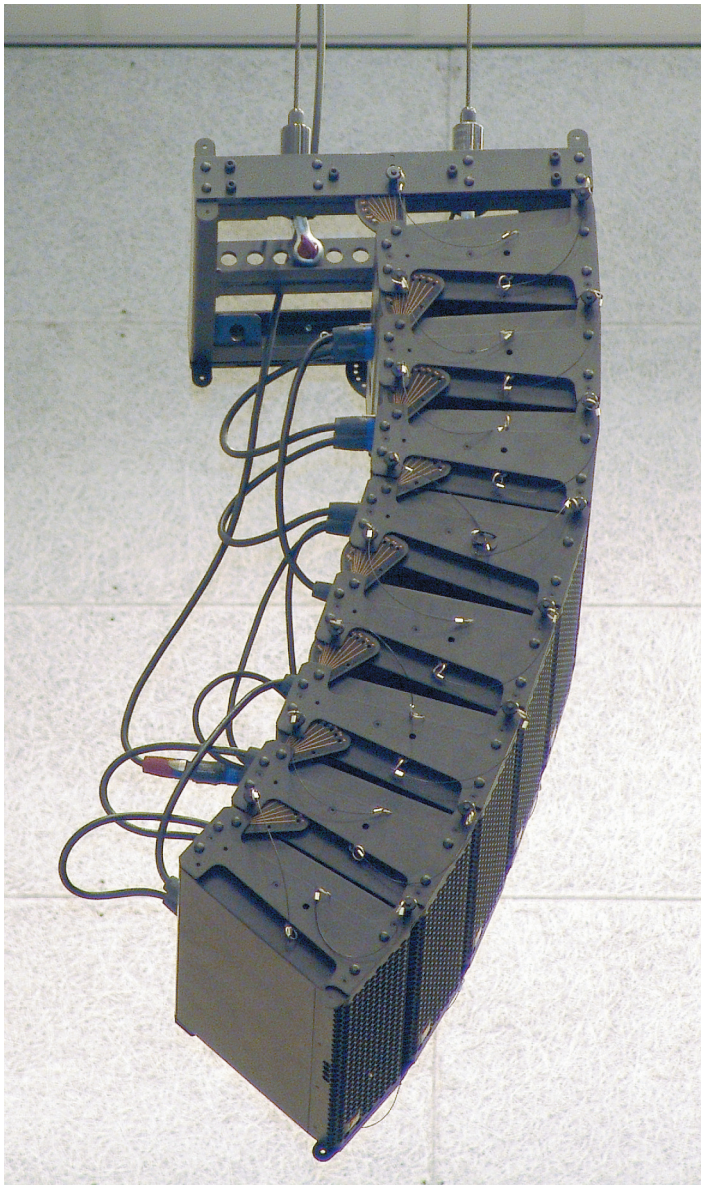
This line array is very small in size and has an aluminum housing. It is equipped with two 5“ speakers, the high-frequency component is supplied by a planar driver located at the rear of the housing and whose sound guide is so long that only a strong vertical bundling is achieved The planar driver, which provides from the very beginning (i.e. at the beginning of the sound guide) a wavefront which does not correspond to the usual spherical-wave cut-out, but is already rectangular. This waveguide serves to connect the sound wavefront with those of the adjacent elements. The systems operate passively and do not have an internal passive crossover. They are supplied with power by external amplifiers and controllers (see photo).

Room - Aula 1

This hall is not a pure lecture hall, but its generous furnishing makes it one of the most representative. It is architecturally very detailed and also acoustically imaginative and effective. A certain detail tells us that it is not only used for lectures, as a concert grand piano (on the stage on the right) is, for example, not necessary at a law school in Jura.
In addition to the frontal photo with the system and the display, I added a photo with the side view. Here you can see a gallery on the right side of the picture. This is for the purpose of lighting and the accommodation of the projector, but there is no audience here. In both pictures, the dimensioning of the system is well expressed, one can not really call the loudspeaker systems particularly large. The two arrays have a comparatively simple task here, they cover the two seating blocks in the classical way. On the big picture at the beginning of the article, the front fills can be seen in the steps of the staircase. The mini speakers in the staircase are also powered by powerful amplifiers. They are small high-power chassis, and at first the planners were a bit worried about whether they would suffice.



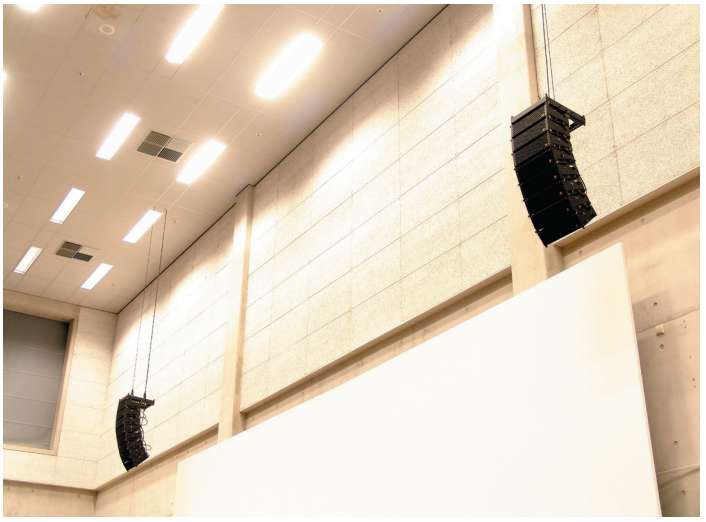
Room Oxford: Here, the reason for splitting up the 8x-arrays becomes clear. Funny detail: Evryone who enters the room, cannot see the loudspeakers. They are only visible if you walk up to the last row and take a seat. This is an indicator for the fact that the placement of the loudspeaker systems have been calculated with centimeter precision. Apart from that, it becomes clear that they only could be placed at their individual well-defined position, which unfortunately could not be accessed by a lift.



Room Oxford: 8x Array

But when the system ran for the first time, they were much too loud and they could be turned back to about half the level. Now they are no longer conspicuous in the overall sound of the sound.
From the theory, the building acoustic measures lose their importance with increasing directivity and precision of the public address system, but are probably taken by the sound engineer and installer as a pleasant bonus.
In this room, it was about providing a perfect voice sound and a pleasant music transmission. You should not speak of thundering PA-basses here, but rather of a broad-band transmission in which nothing is missing.

The bassbox, which is prepared for line array operation, i.e. for suspended operation, is called LABSUB twelve p. It is an ultramodern subwoofer with a 12 „long-stroke chassis and a



Raum Oxford: die beiden 8er Arrays

consistently symmetrical radiating resistance, which, due to its precision, produces sound pressure and depth which are normally not attributed to a conventional 12“ bass.

Room Sorbonne
In the Sorbonne area, they forgot the basses. Small joke, because here the sound system only serves for voice transmission, so basses would only interfere here. Here, too, the operation of the predecessor system was analyzed and ACS and WestLab quickly found out that each individual excessive loudspeaker would have a VERY disastrous effect. With a music performance, the effects would not have been so bad, but speech proved to be extremely sensitive and had to be treated like a raw egg. The company ACS has been occupied with room acoustics for decades and has already „saved“ some space in this respect through a sophisticated sound system.
The WestLab representative for the Netherlands, Mr Arthur van Maurik, knew the WestLab loudspeakers exactly, and also knew that they were practically exemplary to only radiate where they are supposed to. The quite favorable arrangement of the seating blocks also made it possible to omit front fills so that the speech transmission for the students is precise and clear in the first rows as well as from above. But, the front-seat listeners see the display anyway and after a short period of familiarization have the feeling that the language comes from the direction of display. Apart from that, these localization details do not seem to be too important to the students,

In fact, from the simulations it was quite certain that a triple array would be sufficient, but only after a trial, all calculations would be confirmed. People who have once shaken their heads in disbelief have been convinced after a brief spying in the current lecture. However, the three elements are equipped with high-performance chassis, which means that they can be loaded very heavily and the output stages are very large, so they can also transmit spike-type transients with headroom. This also promotes speech intelligibility. Limiters should be

avoided in this case, if all possible. For the overall installation, 4x LABCON Mk 2 and 4x LABAMP 4 were used.

Oxford area
Here, too, it is all about the lecture, and no bass is needed here as well. This room has a balcony. That is why it is about the size of the Sorbonne space, but it is very high. I had the impression of standing in a huge cube. In terms of space, this space is exactly at the boundary between a flatterecho and an echo, which can be recognized immediately even by the layman. And this in two dimensions! Just up and back. This led to the design of more loudspeakers than are compatible with good speech intelligibility. As I said, the more speakers, the worse the voice transmission. If one reduced the 8 element array to 6 elements, the system was lacking volume - but an 8 element array was simply too big. Well, here you could find a solution by means of a trick. In the 8x-array, the high-frequency channels of elements 4 and 5 (the two middle ones) were simply clamped. As the mids and lows continued to be radiated, the volume impression was maintained, but the high-mids and highs, which are the main responsibles for flutter echos, no longer hit a sensitive space volume that was unimportant for the sound, namely the separation between the balcony and the parquet.
This approach is by no means a recipe for all possible spaces, it rather shows that a certain space has to be covered with its own individual working methods. Nevertheless you can keep this „technique“ in the back of your head for future use.

For me, the tour through Erasmus University was a trek of new territory. Apart from the sound reinforcement, which was my main topic, I also realized what an institution, which we know here only with the usual official superstructure and the corresponding mentality, can do when it is in private hands. And even if the sound system is only a tiny cog in a big machine, I realized that original solutions, which also save money by the way, are also possible. I have already noticed that there will be something going on in the foreseeable future in the foreseeable future. On the next Erasmus article in the PROSOUND in a few years!